28th Congress, 2d Session. | Doc. No. 57. | Ho. of Reps. War Dept.

HARBOR AT DUBUQUE.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

A copy of the report of the survey of the harbor at the town of Dubuque.

JANUARY 24, 1845.
Read, and laid upon the table.

WAR DEPARTMENT, *January* 17, 1845.

SIR: On the 31st ultimo I had the honor to report, in answer to so much of the resolution of the House of Representatives of the 26th December last, as could then be furnished by this department. I now respectfully transmit a communication of the colonel of the corps of topographical engineers, containing "a copy of the report of Captain T. J. Cram, of the survey of the harbor at the town of Dubuque, in the Territory of Iowa," required by the resolution.

Very respectfully, your obedient servant,

WM. WILKINS,
Secretary of War.

Hon. JOHN W. JONES,
Speaker of the House of Representatives.

BUREAU OF TOPOGRAPHICAL ENGINEERS,
Washington, January 17, 1845.

SIR: I have the honor to submit to your consideration the survey, plan, and estimate, in reference to the improvement of the harbor of Dubuque, called for by a resolution of the House of Representatives of the 26th of December; that part of the same resolution which called for the report in reference to the construction and improvement of certain roads in the Territory of Iowa having been previously answered.

Very respectfully, sir, your obedient servant,

J. J. ABERT,
Colonel Corps Top. Engineers.

Hon. WM. WILKINS,
Secretary of War.

Blair & Rives, printers.

St. Louis, Mo., *December* 29, 1844.

Sir: In obedience to your orders to me of July 11th and November 11th, 1844, I have the honor to submit this report, with drawings, relative to the harbor of Dubuque, Iowa.

Very respectfully, your obedient servant,

T. J. CRAM,
Captain Corps Top. Engineers.

To J. J. Abert,
Colonel Corps Top. Engineers, Washington.

I.—*Obstructions in the harbor.*

The accompanying chart of the survey shows this harbor is not in the main river, but in one of its collateral channels, of which there are several in this locality.

In times of high and of medium stages of water, there is no absolute inconvenience encountered by boats of the largest class entering this harbor. During usual low and extreme low stages, however, it is inaccessible to these boats, owing to the shoalness of the water in all the secondary channels leading to or from the harbor.

The shoals are the results of sand and mud deposites, arising from the velocity of the currents being modified by the numerous islets, and the consequent precipitation of the silt, which, before reaching these channels, was held in suspension, and carried along in the water. It is only in high and medium stages that the velocities in these channels are sufficient to maintain depths adapted to the free ingress and egress of steamers.

At a stage of $4\frac{1}{2}$ feet above extreme low stage, the mean maximum velocity of the running prism of water in these channels is only 0.962 mile per hour, maintaining an average maximum depth of 9 feet; whilst that in the main river, in the contiguous reach, is 1.5 mile per hour, and maintains an average maximum depth of 14 feet.

There would be no difficulty in removing the existing shoals by the simple process of dredging, so as to allow steamers of the largest class to enter the harbor at the lowest stages. With only this kind of improvement, however, the deposites would unquestionably again grow into obstructions equivalent to their present magnitude; and again the dredge would have to be applied, and thus a continuous expenditure would have to be incurred.

The method of improvement that would be most likely to reduce this subsequent expense of dredging to the lowest sum, would obviously be the best; provided the first cost should not exceed a sum greater in proportion than the advantage to be obtained would justify.

The law making the appropriation has a condition, which will be best understood by quoting the words of the act itself: "For the improvement of the harbor at the town of Dubuque, Iowa, seven thousand five hundred dollars: *Provided*, upon due examination and survey, under the direction of the Secretary of War, it shall appear that a permanent improvement can be accomplished and completed for this amount, so as to admit the landing of steamers of the largest class navigating the river at the town of Dubuque, at all seasons of the year."

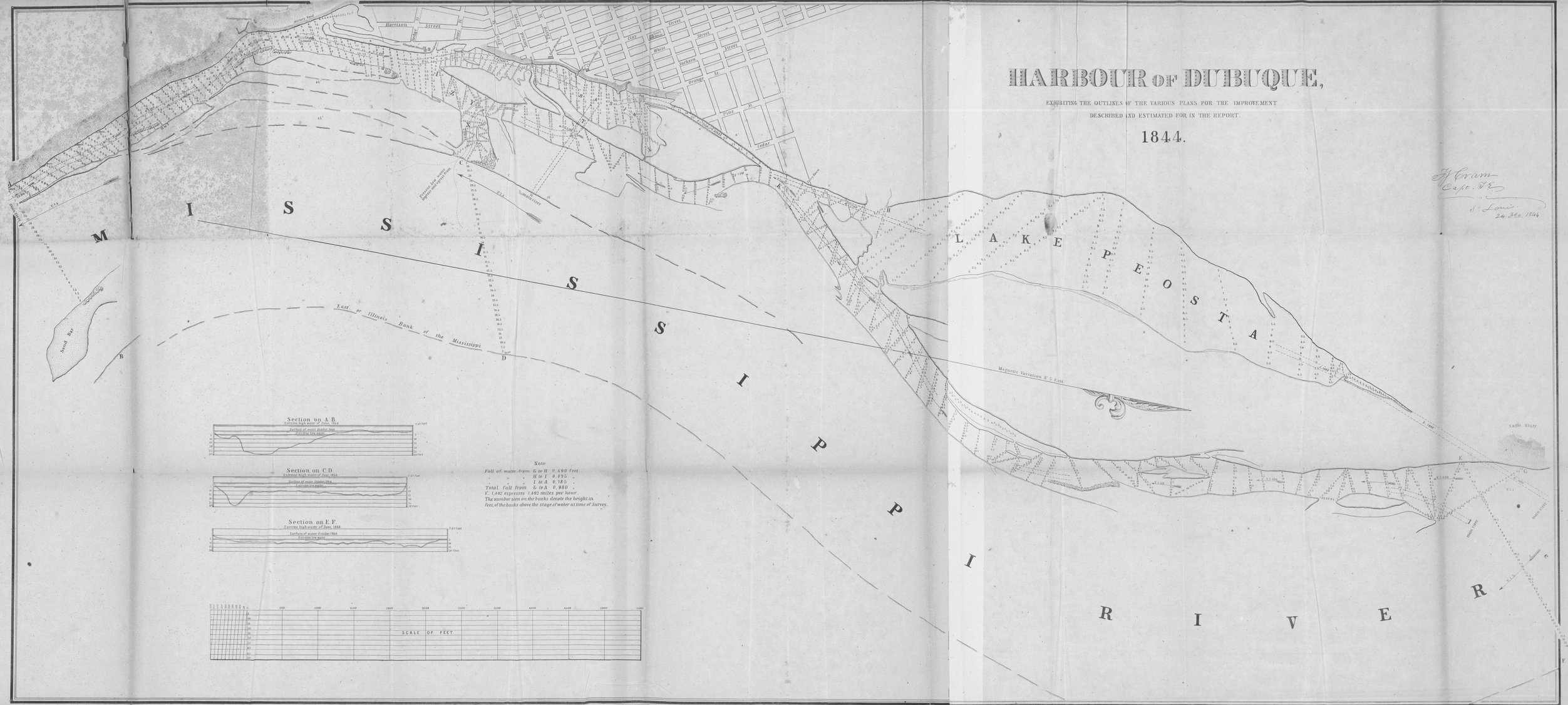
The examination and survey directed in this act were commenced immediately after the subsidence of the waters of the unusual flood of the past summer would allow.

HARBOUR of DUBUQUE,

EXHIBITING THE OUTLINES OF THE VARIOUS PLANS FOR THE IMPROVEMENT
DESCRIBED AND ESTIMATED FOR IN THE REPORT.

1844.

H. Bram
Capt. T.E.
St. Louis
24 Sept. 1844



Note.

Fall of water from G to H 0.690 feet.
" " H to I 0.895 "
" " I to A 0.185 "
Total fall from G to A 0.980 "
V. 1.492 expresses 1.492 miles per hour.
The number seen on the banks denote the height in feet, of the banks above the stage of water at time of Survey.

MISSISSIPPI RIVER

LAKE PEOSTA

The upper Mississippi rose in June and July, 1844, to an elevation of $12\frac{7}{12}$ feet above its extreme low stage at Dubuque, and did not subside to a stage admitting of taking the soundings until in October following, when it was down to a stage lower than the elevation of the June and July flood, by $7\frac{2}{3}$ feet. This is the stage to which the soundings recorded in the chart are all referred, and which is $4\frac{1}{2}$ feet above extreme low stage. The results of the survey are represented on the accompanying general chart in all desirable details.

The law obviously intended the improvements to insure convenient ingress and egress at the lowest stages of water that usually occur, for the largest class of boats then navigating the upper Mississippi.

The extent surveyed, and represented on the chart, embraces the localities of all the reasonable plans that can be suggested for the purpose. To ascertain that which will best meet the intentions of the law, in cost as well as in practical utility, I have thought it expedient to go into a brief description of the plans of improvement the case admits, giving the cost of each; then, by a comparison of all with each other, that which should be adopted and executed will show for itself.

II.—*Plans for the improvement of the harbor of Dubuque, adapted to a depth of four feet in times of lowest stage.*

PLAN No. 1.

Item *a*. Dredge in the bed of the main river, near Eagle bluff, for an extent of 1,000 feet, depth $4\frac{1}{2}$ feet, width 60 feet—10,000 cubic yards, at 20 cents - - - - - $2,000 00

Item *b*. Excavate a steamboat canal from bank of main river, from lower extremity of item *a* into head of lake Peosta: extent 1,800 feet; mean depth cutting 15 feet, width at bottom 48 feet, width at low water line 60 feet; mean width at surface natural ground, 93 feet (suppose no rock)—70,500 cubic yards of earth, at 18 cents - - - - 12,690 00

Item *c*. Dredge present bed of head of lake Peosta for an extent of 1,600 feet, depth 3.334 feet, width 60 feet—11,855 cubic yards, at 20 cents - - - - - 2,371 00

Item *d*. Dredge bed of channel, from near foot of lake Peosta, to head of existing artificial canal: extent 2,200 feet, depth 0.767 foot, width 60 feet—3,750 cubic yards, at 20 cents - 750 00

Item *e*. Deepen that canal, also the head of the natural basin just below, as far down as the foot of Orange street: extent of dredging in canal and head of basin 2,250 feet, depth 5.45 feet, mean width 56 feet—25,435 cubic yards, at 20 cents - 5,087 00

Item *f*. Dredge bed of natural channel, from Longworthy's warehouse down to Jones street: extent 1,600 feet, depth 2.111 feet, width 60 feet—7,505 cubic yards, at 20 cents - 1,501 00

Item *g*. Dredge bed, and remove from natural channel, commencing at Jones street, and going all the way down, along foot of bluff (seen on the chart) quite into the main river, near A, for an extent of 7,000 feet, depth 1.188 foot, width 60 feet—assimilated in cost to an excavation of 18,480 cubic yards, at 50 cents - - - - - - 9,240 00

Item *h*. Steam dredging-machine, $5,000; 2 mud scows, at $600; 2 yawls, at $100 - - - - -	$6,400 00
Item *i*. Superintendence and contingencies - - -	3,000 00
Total cost of plan No. 1 -	43,039 00

By making the excavations to a depth of 4 feet below extreme low stage, as herein estimated for, we should have an open navigation at the lowest water for the largest class of steamers then navigating the upper Mississippi, all the way from the main river near Eagle bluff, into the main river again in the vicinity of A: the whole extent being about $4\frac{3}{4}$ miles, and the aggregate of all the items of the improvements about $3\frac{1}{3}$ miles.

The channels, thus improved, would not be very liable to deposites to any very serious amount from river silt; the total fall from C to A being the same as in the main river; and the mean rate of fall in the improved channel being no less than what pertains to the main stream. This total fall, at the time of the survey, only amounted to 0.98 foot, giving the mean rate of fall $2\frac{9}{10}$ inches per mile at the stage of $4\frac{1}{2}$ feet above extreme low water.

The velocity in the channel would be nowhere so great but that a boat could ascend with perfect ease.

This plan, (No. 1,) executed to the extent of all the foregoing items, would not impair, but, on the contrary, would be conducive to the general health of the place; and the improvements would be as permanent as the case admits.

Plan No. 2.

Item 1. Instead of using lake Peosta, deepen the secondary channel (seen on the chart) just east of that lake, by dredging wherever needed, from the point I, in the main river, down to the point K, a little above the head of the canal: extents of dredging, 1,200, 750, 5,200 feet; corresponding depths, 2.929, 1.6, 3.14 feet; width, 60 feet—aggregate number of cubic yards 46,765, at 20 cents - - - - - -	$9,353 00
Item 2. Deepen canal, also head of basin, exactly the same as item *e* in plan 1 - - - - - -	5,087 00
Item 3. Dredge bed of natural channel, same as item *f* in plan 1	1,501 00
Item 4. Dredge bed of, and remove rocks from, natural channel, same as item *g*, plan 1 - - - - -	9,240 00
Item 5. Machine boats, &c. - - - - -	6,000 00
Item 6. Superintendence and contingencies - - -	3,000 00
Total cost of plan No. 2 -	34,181 00

This plan would cost about 20 per cent less than No. 1, and it would afford equal immediate harbor facilities; but it is obviously inferior to plan No. 1, if we take into account the prospective wants commensurate with the probable future growth of the place, the greater liability to deposites, and that it is less conducive to health.

Plan No. 3.

Item 1. Same as item 1 in plan No. 2—improving natural channel from I to K - - - - - -	$9,353 00

Item 2. Abandon existing canal, and, in lieu, cut a new steamboat canal S, from that channel into the basin: aggregate length of dredging from deep water to deep water, 1,275 feet—13,815 cubic yards, at 20 cents - - -	$2,763 00
Item 3. Same as item *f*, plan No. 1 - - - -	1,501 00
Item 4. Same as item *g*, plan No. 1 - - - -	9,240 00
Item 5. Same as item *h*, plan No. 1 - - - -	6,000 00
Item 6. Same as item *i*, plan No. 1 - - - -	3,000 00
Total cost of plan No. 3 -	31,857 00

This would cost only about 4 per cent. less than No. 2; and although we should have an open communication all the way through, still the crookedness of the canal S, and of the adjacent part of the natural channel, would make these so much more liable to fill up, that this plan is obviously inferior to No. 2.

PLAN No. 4.

Item 1. Same as item 1 in plans 2 and 3—improving the natural channel from I to K - - - - - -	$9,353 00
Item 2. In lieu of a steamboat canal at S, dig a narrow, deep feeder at S, to supply the basin; the bottom of the feeder to be 4 feet below extreme low stage—4,605 cubic yards, at 20 cents - - - - - - -	921 00
Item 3. Open a steamboat canal, T, from deep water in the basin to deep water in the secondary channel—8,090 cubic yards, at 20 cents - - - - - -	1,618 00
Item 4. Dredge bed of channel just below eastern extremity of T: extent, 575 feet; depth, 0.7 foot; width, 100 feet—1,490 cubic yards, at 20 cents - - - - -	298 00
Item 5. Dredge bed of channel marked X (which is the present steamboat low-water ingress to and egress from the harbor) for an extent of 730 feet; depth, 2.5 feet; width, 100 feet—6,760 cubic yards, at 20 cents - - - -	1,352 00
Item 6. In lieu of the ideas of improving (as contemplated in plans 1, 2, and 3) the channels below the foot of the basin, substitute a dam, Y, to turn all the water now passing down the channel marked Z, out through X, with a view to keep this channel (X) free from deposites: length of dam, 600 feet; height, 15 feet; mean thickness, $12\frac{1}{2}$ feet—$4,166\frac{2}{3}$ cubic yards brush, stone, and earth, at $1 50 - - -	6,250 00
Item 7. Horse-dredge, $2,500; scows, $600; yawls, $150 -	3,250 00
Item 8. Superintendence and contingencies - - -	2,000 00
Total cost of plan No. 4 -	25,042 00

The principal objection to this plan would be, that the steamboat canal T would be liable to deposites, which the force of the current from the basin would not be sufficient to sweep out.

PLAN No. 5.

Item 1. Suppose we abandon the idea of improving the natural channel between I and the basin, but construct the deep feeder S, to supply the basin from that channel—4,605 cubic yards, at 20 cents	$921 00
Item 2. Steamboat canal T, same as item 3, plan 4	1,618 00
Item 3. Dredge bed of channel just below eastern extremity of T, same as item 4, plan 4	298 00
Item 4. Dredge bed of channel marked X, same as item 5, plan 4	1,352 00
Item 5. Construct dam Y, same as item 6, plan 4	6,250 00
Item 6. Machinery, boats, &c., same as item 7, plan 4	3,250 00
Item 7. Superintendence and contingencies	2,000 00
Total cost of plan No. 5	15,689 00

This plan would give ingress and egress only through the present route—*i. e.*, from the main river, near C, through the channel X, and back through the same; and there would be no low-water steamboat communication through any other of the secondary channels. The dam Y would have the effect of assisting in keeping X free from deposites; the same objection applies to this plan, however, as to plan No. 4, in reference to deposites in T. The crookedness of the route in this plan would induce deposites; and the annual expense for dredging might be expected to be considerable, notwithstanding the dam Y, which, although it would assist to keep X clear, would induce deposites in the vicinity of the eastern extremity of T.

PLAN No. 6.

Item 1. Deep feeder S—extent of dredging for this, 1,275 feet; mean cross section, 44 feet wide; bottom 4 feet below extreme low stage—9,795 cubic yards, at 20 cents	$1,959 00
Item 2. Steamboat canal T, from basin to channel east	1,618 00
Item 3. Dredge bed of channel below east extremity of T—1,490 cubic yards, at 20 cents	298 00
Item 4. Dredge bed of channel X—6,760 cubic yards, at 20 cents	1,352 00
Item 5. Machinery and boats, same as in plan 5	3,250 00
Item 6. Superintendence and contingencies	1,800 00
Total cost of plan No. 6	10,277 00

This plan is the same as No. 5, with the single exception of the dam Y. By this plan we should have the harbor improved so that steamers could enter the basin and come out again through the channel X, at the lowest stages; and, were it not for the liability of its filling by a precipitation of silt, a tolerably convenient low water harbor would be permanently insured. Should this plan be adopted, the dredge would have to be used from time to time, to keep the route free from the deposites.

PLAN No. 7.

Item 1. Prolong the canal T, by a thorough-cut straight out into the main river, to the point U. This canal to be 48 feet wide on the bottom where cut through the islands, 60 feet wide at low-water line; extent of the work, from deep water in the basin to deep water in the main river, 1,500 feet—whole amount of excavation, to bring the bottom of the canal 4 feet below lowest stage of water, 36,625 cubic yards, at 20 cents -	$7,325 00
Item 2. To construct on both sides of the canal, where it would cross the present natural channels, substantial dikes, forming the side banks of the canal—extent of these dikes, 750 running feet, at $10 - - - - - -	7,500 00
Item 3. Construct a dam across the lower end of the basin, on the line *x y*, (seen near the foot of 2d street, on the chart,) 230 feet, at $10 - - - - - - -	2,300 00
Item 4. Construct sluice-gates in the canal, which, on being closed, would back the water at low stages within the natural banks, so as to acquire a head equal to the total fall from where the secondary channels branch off from the main river to the canal. This would suffice, on opening the gates, to sweep out the deposites that may have accumulated from the basin to the extremity V, quite into the main river: cost of the gates - - - - - - - -	3,000 00
Item 5. Dredge, scows, &c. - - - - -	3,250 00
Item 6. Superintendence and contingencies - - -	2,000 00
Total cost of plan No. 7 -	25,375 00

It will be seen that this plan would stop the current in low stages, and produce stagnant water below the works, which would be a serious objection. Again, in times of high water, the effect upon the dikes would in all probability be such, that the cost of repairs would be quite as much as the expense of dredging incident to some of the other plans.

PLAN No. 8.

Construct some kind of work, in the nature of a causeway, from the town to the bank of the main river, where may be found good landing for all classes of boats at lowest stages. When the stage would be such that the boats could not enter the present harbor, they might land at the outer extremity of the work, and drayage resorted to for the transportation over the causeway.

There are several points in reference to such a work, as here suggested, that deserve careful consideration. Should it be in the character of a continuous dam, that would cut off all running water at stages below its summit? or, should it be in the nature of a bridge having openings? I am of opinion it should possess the latter quality. Again: ought it to be made so low as to be become submerged at the stage when it would not be needed, from the boats then being able to enter the present harbor? or, should it be so high, that its superstructure would be above the highest stage of water? I think the latter would be the best elevation to give it. According to these

views, there would be 18 open spans of 100 feet each, 17 piers, and 2 abutments of stone; 1,800 running feet of mineralized white pine superstructure.

Item 1. 19 wooden foundations, for masonry of piers and abutments to start from, at $1,000	$19,000 00
Item 2. 2,603 perches masonry in all, at $5, including digging foundations	13,015 00
Item 3. Mineralizing lumber for superstructure	2,000 00
Item 4. 1,800 running feet superstructure, (3 parallel trusses, 2 roadways, each 13 feet wide,) at $10	18,000 00
Item 5. 1 steamboat draw	500 00
Item 6. Paving bank at outer extremity, 15 by 300 feet	360 00
Item 7. Superintendence and contingencies	3,000 00
Total cost of plan No. 8	64,875 00

This plan would allow free passage of water in the channels and over the banks in all stages. The openings would obviate all liability to deposites. The superstructure would be above all accidents, the tops of the sustaining piers being 8 feet above the surface of the water in October last. Aside from the cost, the only objection to this plan is in the possibility of a change that might occur at the outer extremity in the main river, so as to prevent steamers from coming up to the levee.

Plan No. 9.

The works enumerated in plan No. 8 are expensive. With less first cost, though with less durability and less practical convenience in its use, the same end may be obtained by making a causeway that would be submerged, as before suggested.

For this purpose, drive 3 parallel rows of piles—distance between the rows 13 feet, and from pile to pile in each row, 10 feet; the piles to be 25 feet long, and driven so that their tops shall be 2 feet below the mean natural surface of the ground which the causeway is to cross. Floor-beams, 3 by 12 inches, to be laid edgewise on tops of the piles; floor-strings, 3 by 10 inches, to be laid transverse to the floor-beams; and these strings to be crossed by a 3-inch plank flooring.

The lumber to be previously mineralized; the top of the floor to be even with the top of the ground; and the whole superstructure well fastened down to the heads of the piles.

In crossing all the channels intervening between the town and the main river, two bridges would be required, having 4 abutments, 1 pier, and 400 running feet of superstructure.

Item 1. 420 piles, at $2 50 each; 140 floor-beams, 3 by 12 inches, 28 feet long; 10,290 running feet floor-strings, 3 by 10 inches; 1,400 plank, 3 by 12 inches, 28 feet long—lumber at $15 per M	$3,373 00
Item 2. Mineralizing 12,900 cubic feet lumber, at 12 cents	1,548 00
Item 3. Pile-driver, $500; fitting and driving piles, $420	920 00
Item 4. Labor of laying 392 squares of flooring, at $1 per square	392 00
Item 5. Spikes and iron bolts	200 00

Item 6. Wooden foundations for abutments and piers -	-	$5,000 00
Item 7. 480 perches masonry, at $5, including digging of foundations - - - - - -	-	2,400 00
Item 8. 400 running feet superstructure of bridges, at $15	-	6,000 00
Item 9. Steamboat draw - - - -	-	500 00
Item 10. Superintendence and contingencies - -	-	2,000 00
Total cost of plan No. 9	-	22,333 00

In this plan, the bridges and all else would be submerged at every high stage of water; only the bridges, however, would be in danger. The works would stop the running water but very slightly, nor would they induce additional deposites in existing channels. The same objection, however, applies to this, as to plan No. 8, in reference to a possible change in the main river at the outer extremity of the work.

Having now given the cost, advantages, and disadvantages of each of all the plans entitled to any consideration, all who are interested in the matter may draw their own conclusions in reference to which should be adopted. I am of the opinion that plan No. 1 is best calculated to meet that part of the intention of the law requiring a permanent improvement; but to execute it, more than what is authorized in the act, by the sum of $36,639, will have to be appropriated. If we adopt the cheapest plan, (No. 6,) disregarding the idea of permanency, and looking only to the first cost of things, more, by the sum of $3,500, will have to be appropriated than authorized by the existing law, and the restriction in the existing law removed.

I am, very respectfully,

T. J. CRAM,
Captain Corps Top. Engineers.

J. J. ABERT,
Chief Topographical Engineers, Washington.